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Poultry Housing Tips

Radiant Brooder Installation and Management

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Low air temperatures during the first few days of a bird's life may be more harmful than you may think. A newly hatched chick is more like a cold-blooded reptile than a bird. Their body temperature, and therefore, their level of activity is heavily influenced by the temperature of the air around them. If the air is warm, the chick will be warm and show a high level of activity (i.e., running around, eating and drinking). But if the air is cold, the chick will be cold and tend to huddle and sit around. Since a cold chick does not eat and drink as much as a warm chick, performance can suffer. The effect that cold temperatures have on young chicks was demonstrated in a study conducted by Poultry Science students at The University of Georgia. They documented that day-old chicks exposed to an air temperature of 55°F for only 45 minutes had significantly lower weights at the end of the growout compared to those that were not cold stressed.

Day-old chicks subjected to such low temperatures is not very common, but you may be surprised how often they are placed in houses where floor temperatures are in the sixties or low seventies. This is because many times growers are concentrating on air temperature and not floor temperature. Thermometers and heater thermostats are typically placed a few feet above the ground to make them easier to read as well as to keep them out of the reach of the chickens. As a result, the desired room temperature is obtained a few feet off the floor. A day-old chick is only a few inches tall when standing. When they are sitting down on the floor they are less than two inches tall. The temperature of the air this close to the ground is basically determined by the temperature of the floor. If the floor is cool and wet, the birds will be cool and wet. Conversely, if the floor is warm and dry, the birds will be warm and dry. To minimize potential problems, furnace thermostats should be placed approximately one foot off the floor during the first week and if necessary, raised each week so that they stay approximately one foot above standing bird height.

To help further insure a relatively warm floor, houses with forced air furnaces should be preheated to at least 85°F for a minimum of 48 hours before the chicks arrive. It takes about this long for the shavings to be warmed to sufficient depth. If the house has wet shavings, it may take 72 hours or more. But, even with this level of preheating, field measurements have shown that floor temperature will be approximately two to five degrees cooler than the air temperature a couple of feet off the floor. Furthermore, the temperature of the floor near the side walls is typically five or more degrees cooler than that near the center of the house. As a result, if you want a floor temperature of 85°F, the temperature of the air in the house will need to be closer to 90°F than 85°F.

Many growers are installing radiant brooders in their new houses to insure that their floors are warm and dry during brooding. Radiant brooders heat a poultry house in two ways. First, they heat the air like a furnace. In fact, approximately 60 percent of the heat produced by a radiant brooder is put off in the form of hot air. Second, radiant brooders warm the birds and the floor by radiating heat directly to the floor without having to heat the air.

PUTTING KNOWLEDGE TO WORK

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Radiant heat is misunderstood by many people. Basically, radiant heat is a type of light. You can't see this type of light, but you feel its warming rays. Hot objects put off this form of invisible light (infrared light) in addition to the form you can see (visible light).

An example of this type of heat is a campfire on a cold night. The fire does not do much air heating around the area of the fire because the warm air produced by the fire quickly rises. But when you stand facing the fire, you feel warmth. This warmth is from radiant heat not air heat. You can tell that you are being exposed to radiant heat because only the portions of your body facing the fire will feel warm. Only the portions of your body facing the fire are being exposed to radiant heat. If the fire were heating the air near the ground, your whole body would feel warm. Basically, only those surfaces which are exposed to the visible light would be exposed to the infrared heat.

The amount of radiant heat a chick receives from a brooder depends on the amount of radiant heat produced by a brooder, the chick's distance from the brooder, and the height of the brooder. Radiant brooders differ from conventional brooders in that they have larger radiant elements. The radiant element is the part of the brooder which is heated by the burner flame and glows red or orange. The radiant elements on radiant brooders are significantly larger than those of conventional brooders. They are often shaped to form large cones or cylinders with two to four times the surface area of conventional brooders burners. With this increased surface area, radiant brooders tend to produce significantly more radiant heat than conventional brooders, and therefore heat more floor area than conventional brooders.

Because radiant brooders produce more radiant heat they can be placed higher above the ground than conventional brooders. This increases the number of birds benefiting from the radiant heat produced by the brooders. An example of this phenomenon is a group of people in a room trying to read with one small light bulb. The small light bulb would probably only produce enough light for few people to read if they sat right next to the bulb. In order for everyone in the room to have enough light to read, multiple lights would be required. But, if a larger wattage light bulb were used

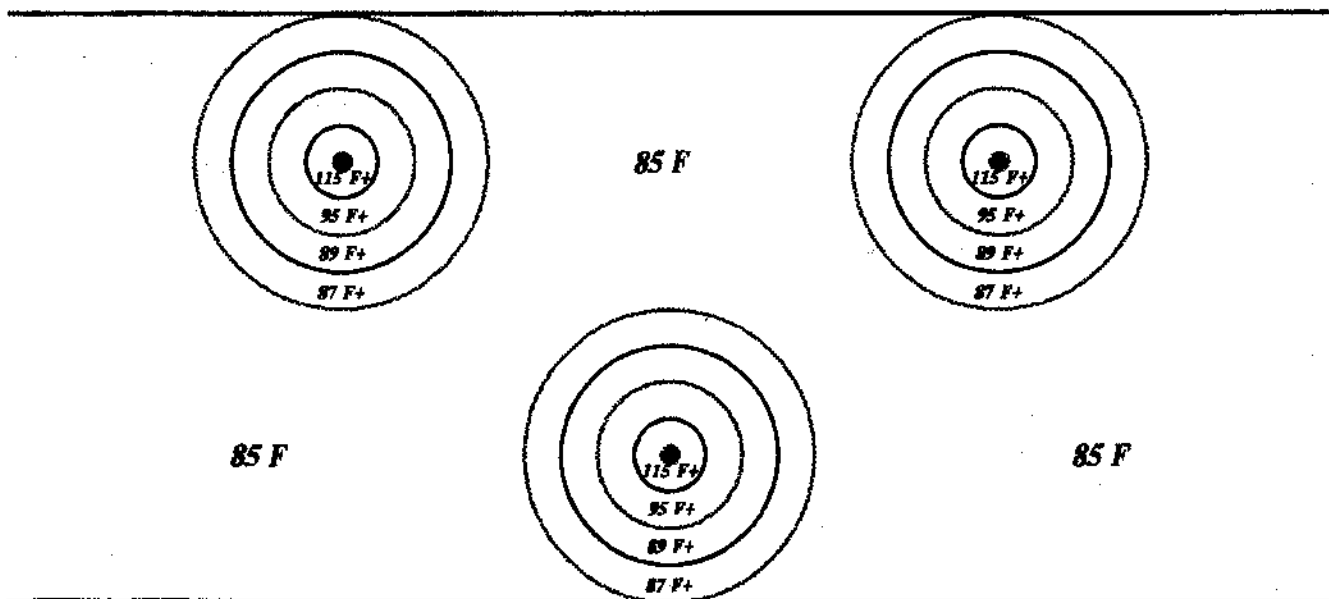


Figure 1. Broiler house with "hot spots" created by radiant brooders (brooder height = 4 1/2')

it could be raised to the ceiling and there would be enough light for everybody to read their books. If the larger wattage light bulb were not raised, the light would be focused on such a small area that it would probably be too bright to read if you sat close to the bulb and there would be too little light far from the bulb to benefit the rest of the people in the room. In the case of radiant brooders of course, we are concerned with radiant heat, not light, but the concept is the

same.

The amount of radiant heat a chick receives depends on how close it is to a radiant brooder. A chick directly under a brooder will receive four times as much heat as a chick six feet from the brooder. This variance in radiant heat should not be viewed as a problem but more as a benefit. The temperature a chick requires varies from chick to chick as well as from day to night. A smaller chick may require a little more heat than a larger chick. And, if it gets windy outside, the house may become a little more drafty and some chicks may want a little more heat. The temperature gradient under the radiant brooder allows the chicks to select the area of the house that is most comfortable to them at any specific time.

In a properly managed house with radiant brooders, the heated air produced by the brooders is used to bring the temperature of the air in the brooding area up to the mid eighties; a temperature which is comfortable for most chicks. Then the radiant heat produced by the brooders is used to create "hot" spots the chicks can move in and out of as they see fit (Figure 1). Figure 2 shows the temperature increase of the floor at different distances from the brooder when the brooder is placed at a height of four-and-a-half feet. For instance, if the house temperature were 70°F, the floor directly under the brooder would be 112°F ($70^{\circ}\text{F} + 42^{\circ}\text{F} = 112^{\circ}\text{F}$).

The actual floor temperatures if the temperature of the air in the house were 85°F is illustrated in Figure 3. As you can see, floor temperatures will range

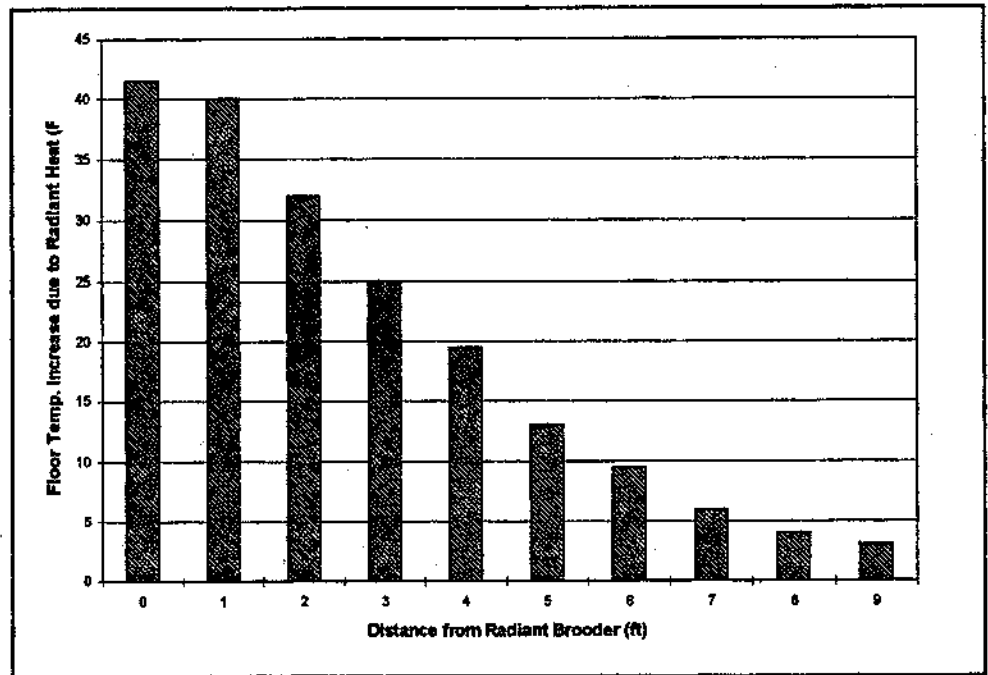


Figure 2. Floor temperature increase due to radiant heat from brooder.

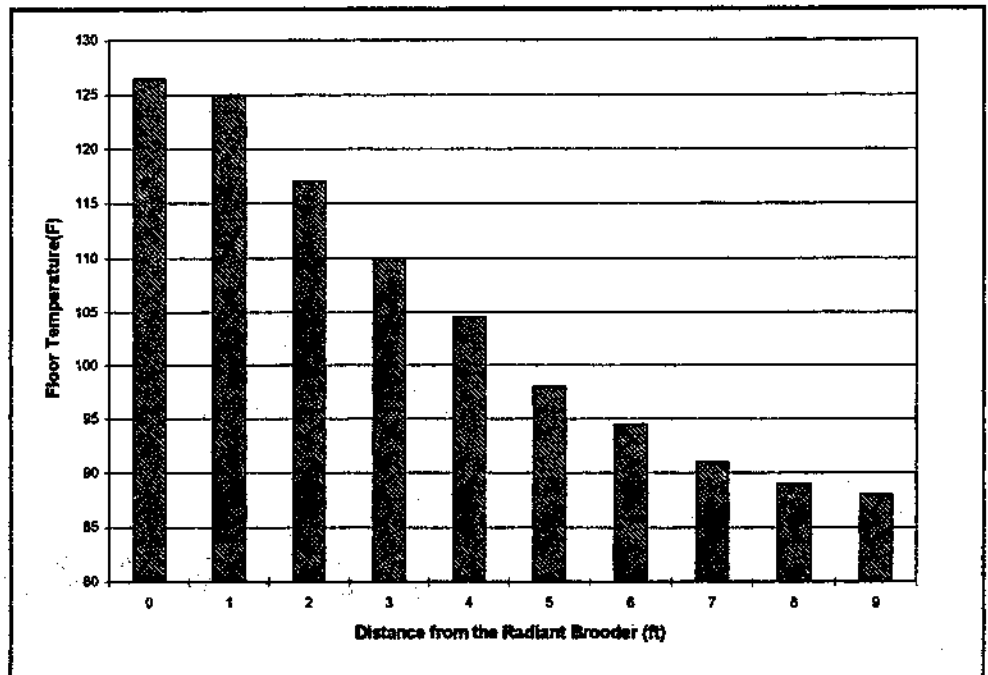


Figure 3. Floor temperature in house with radiant brooders.
(house air temperature = 85°F)

from approximately 125°F directly under the brooder to about 88°F at eight feet from the brooder.

As mentioned previously, the distribution of radiant heat from a radiant brooder changes depending on the height of the brooder. The lower the height, the more concentrated the radiant heat below the brooder. The higher the brooder, the greater the floor area which is covered by the brooder. Figure 4 shows the additional heat received by the floor when radiant brooders are placed at different heights. Figure 5 illustrates floor temperatures in a house where the air temperature is 85°F and the brooders are installed at different heights.

A radiant brooder at a height of three and a half feet heats the floor directly under the brooder much more than a brooder placed at four-and-a-half or five-and-a-half feet. But, floor temperatures farther out are significantly higher.

Placing radiant brooders too low creates two problems. First, the area directly under the brooder may be too hot for birds. Secondly, the area directly under the brooder is becoming excessively hot at the expense of the floor farther from the brooder. There is approximately 28 square feet of floor area within three feet of the brooder. On the other hand, the area within four to eight feet of the brooder amounts to over 122 square feet.

If you assume that 16 chicks can fit into one square foot of floor space, this means that 448 chicks can fit within three feet of the brooder, whereas almost 1800 chicks can sit between four and eight feet of a brooder. So installing radiant brooders too low dramatically decreases the total number

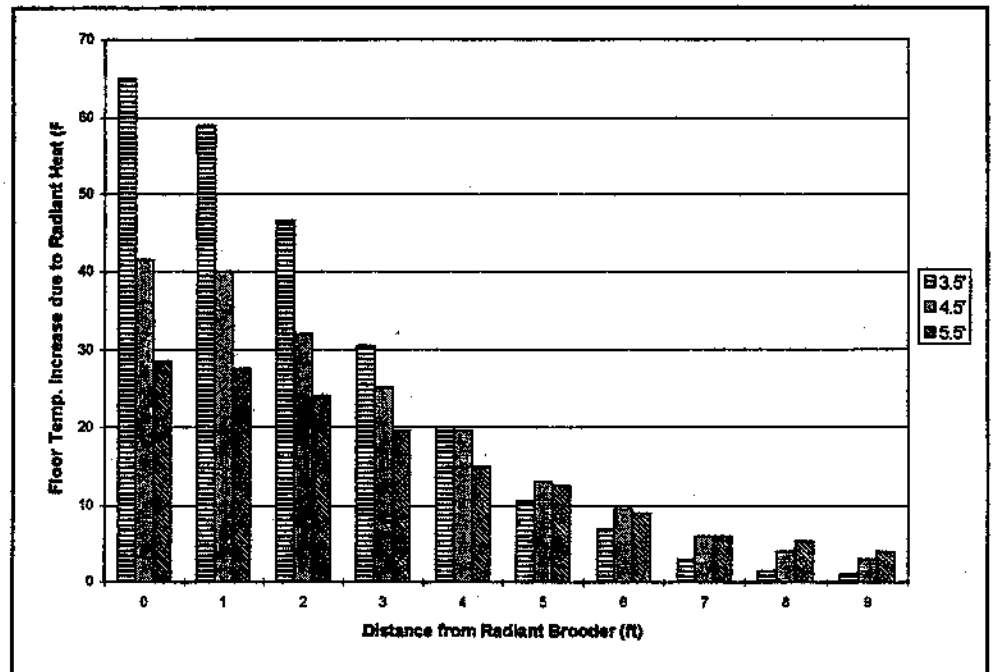


Figure 4. Floor temperature increase due to radiant heat from brooders (radiant brooder height = 3 1/2', 4 1/2' and 5 1/2')

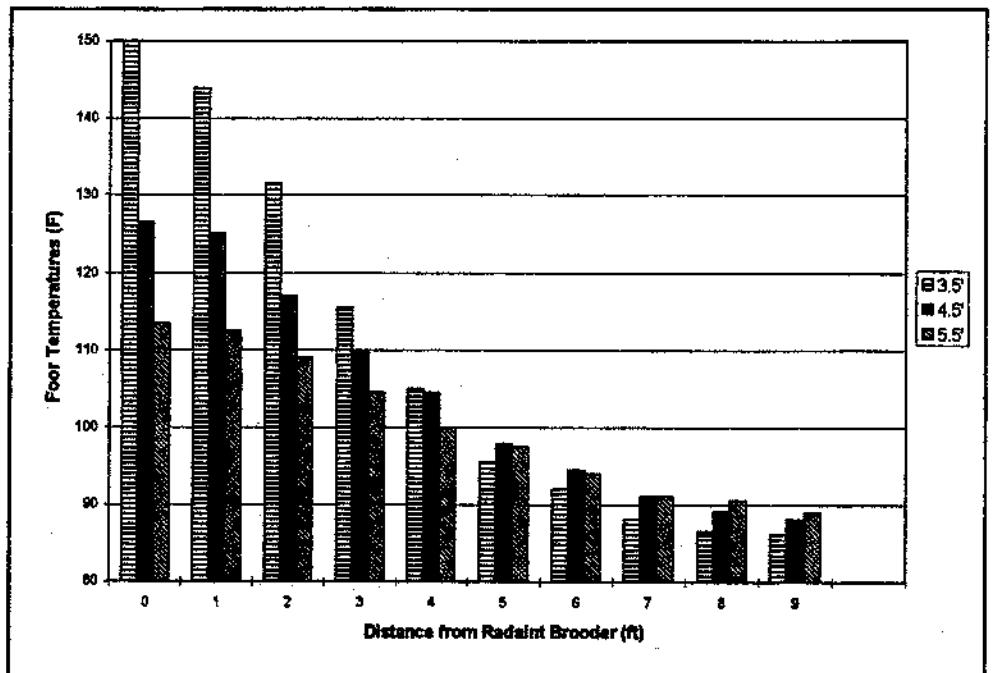


Figure 5. Floor temperature as affected by brooder height. (house air temperature = 85°F)

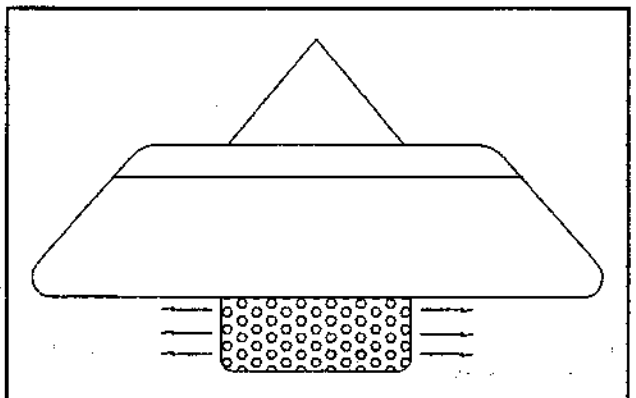
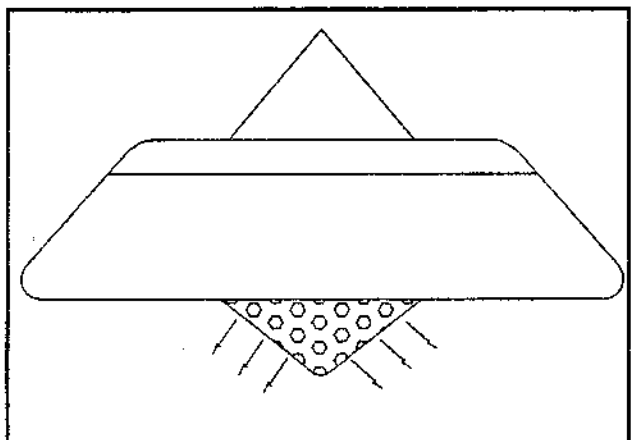
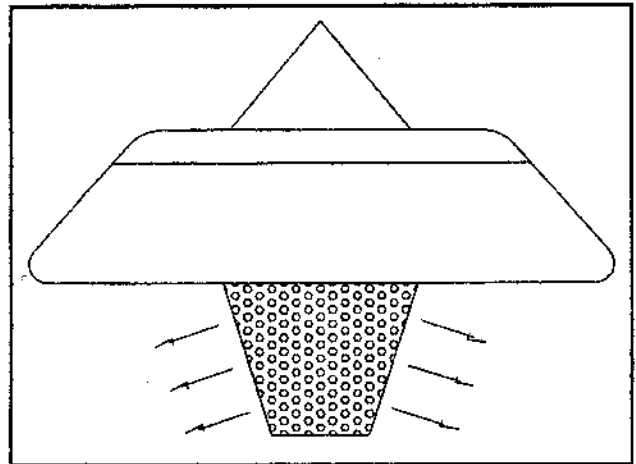
of chicks that receive a significant amount of radiant heat.

Another factor to consider when installing radiant brooders is placement. Though radiant brooders do heat the entire house, the area which birds receive a significant amount of radiant heat is limited. From the charts above, it can be seen that the amount of radiant heat that birds receive is fairly limited more than six or seven feet from the brooder. Therefore, when a radiant brooder is placed at a height of about five feet, it will produce a radiant heat zone in the shape of a circle 14 feet across. Outside this area, the house is primarily heated by the hot air produced by the brooders.

When it gets cold, the birds will tend to move into the radiant zone under the brooder to receive additional radiant heat. If the brooders are placed down the center of the house, chicks may be pulled away from feed and water. If the brooders are placed in two rows near the feed and water lines, the birds will not have to leave the feed and water when it gets cold. Furthermore, chicks often tend to hug the walls when first placed. If the brooders are placed down the center of the house, chicks near the walls tend to huddle instead of moving toward feed and water. Some people have expressed concern about water lines becoming too hot if they are near radiant brooders. If the brooders are placed at the appropriate height, water heating will be minimal.

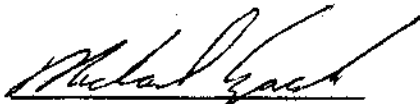
To obtain proper control over house temperature and fuel usage, radiant brooders should be controlled by thermostats. It is not necessary for every brooder to have its own thermostat. In general, the brooders should be grouped in zones, with three or four brooders per zone. For example, the four brooders closest to the brooding curtain would be one zone, the four brooders nearest the brooding end wall would be another zone, and the three or four brooders in the center of the house would be a third zone. Thermostats controlling these zones should be placed no closer than 15' from a brooder. Thermostats placed too close to a radiant brooder will be heated by the radiant heat produced by the brooder. This can result in the thermostat indicating the house is warmer than it really is and shutting off the brooder prematurely.

The data used to generate the figures in this newsletter were measured in a broiler house with Shenglow™ brooders. Other types of radiant brooders produce very similar patterns. The precise temperature profile is influenced by the shape of the radiant element. For instance, the radiant element of an Infraconic™ brooder is in the shape of a flat cone that comes to a point (the Shenglow's™ radiant element is shaped like a cone with the point cut off). The Infraconic™ shape directs the heat slightly more downward than out, creating more heat directly under the brooder. To obtain temperature patterns similar to those shown in the various figures, the Infraconic™ brooder should be installed about 12" higher than the height recommended for the Shenglow™. A Maywick™ brooder

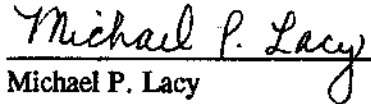


brooder should be installed about 12" higher than the height recommended for the Shenglow™. A Maywick™ brooder

has a radiant element in the shape of a cylinder, directing the heat more outwardly than down, creating a slightly cooler spot directly under the brooder. As you might expect, these brooders are often installed a little lower to create a similar floor temperature profile. In general, radiant brooders should be installed at a height of five feet. The birds will tell you if the brooders should be raised or lowered slightly. If the birds move from directly under the brooder, they should be raised. If the birds huddle tightly under the brooder, they probably should be lowered. Unlike with traditional brooders, birds should not form a donut pattern under a radiant brooder. They should sit fairly uniform in a large circle when it gets cold. As with most areas of management, the best way to know if your operating radiant brooders correctly is to watch your birds.



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Other *Poultry Housing Tips* newsletters on radiant brooders:

Radiant Brooders. January, 1991

Fuel Savings with Radiant Brooders. March, 1991

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